Small Farms Research News

USDA, ARS, SPA

Spring 2003 1st Edition

Pines, Events, and More

A Loblolly Pine Stand In Transition

In the summer of 2001 we thinned an 18-year-old pine stand at the Rogers Scout Reservation. The stand consisted of approximately 15 acres of tree rows spaced 10 feet apart and trees in the rows were spaced every five feet. During the thinning process we removed out every other tree row and a number of trees within the remaining rows. About 60% of the original stand was harvested. The trees were sold for pulp. The contractor thinned the stand using all mechanical equipment. The trees were cut using a hydro-ax with a buss-saw attachment. The hydro-ax could cut one tree, hold on to it, and then go to the next tree. It could cut and hold up to 4 or 5 trees before laying them down for the skidder to pick up. The skidder would skid each stack of trees outside the pine stand to a delimber. The delimber would strip the limbs, cut them for length, and load them on a truck for delivery to the mill. When the contractor finished, we had 20-foot alleys between tree rows. Each alley had a row of stumps (average diameter of 10 inches), and some residue consisting of broken branches, bark, and pine needles.

Our goal was to establish some type of forage in the alleys between the tree rows. We considered cool season vs. warm season, annual vs. perennial, and decided to use two different forage varieties. Annual Ryegrass (cool season annual) in some alleys, and Orchardgrass (cool season perennial) in the other alleys. The first step was to remove the stumps in the middle of each alley. We looked at several different ways to remove the stumps before deciding to use a tractor mounted 3-point hitch stump grinder. The stump grinder was economical, easy to use, and had little to no effect on the standing trees. We were able to grind more than 4000 stumps six inches below the soil surface in less than two weeks. We believe the stump grinder was a good investment. The residue in the alleys now consisted of shavings produced from the stump grinder, broken branches, bark, and pine needles. A road grader was used to windrow the residue in the middle of the alleys. A good tractor-mounted farm blade would work just as well. The windrows were then burned removing 90% of the residue.

The next spring (2003) we started disking the alleys to prepare a good seed bed. The other 10% of the residue had begun the decaying process and the disk had no problem mixing it in with the soil. The soil was disked to a depth of 6" staying about 2.5 feet away from the standing trees. The alleys were kept fallowed and disked twice more during the summer for weed control. Around September 1st lime was applied at 2 tons per acre. A Brillion drop seeder was used to seed the Orchardgrass and Ryegrass. The tractor mounted 3-point hitch seeder has a coulter-packer in front of the seed drop and another that follows the seed to lightly cover and make a smooth level surface. The Orchardgrass was planted on September 23, and the Ryegrass on September 24. Two weeks later a complete fertilizer (19-19-19) was applied at a rate of 425# per acre. Although we have not yet taken yield data, the forage and tree stand look great. We believe this combination will provide excellent winter grazing while supporting good tree growth.

Pine Establishment and vegetation control

Successful tree establishment whether in an agroforestry or forestry setting is often dependent on the control of competing vegetation. An experiment was conducted in the mid 1990's on the Booneville Research Farm. Three species of pine trees (loblolly, shortleaf, longleaf) were planted into two different sod types, tall fescue or common bermudagrass. Seedlings trees were planted during the winter and averaged about 6 inches in height. The competition from these grasses was controlled by one of three methods: 1) no control, i.e. the grass was allowed to grow unhindered; 2) chemical control by the application of the herbicide,

Roundup™; and 3) a landscape cloth as a mulch. The effectiveness of the treatments was determined by measuring the height of the pine trees approximately one year after planting.

All three pine species responded to the vegetation control treatments similarly. Therefore the data have been averaged across pine species for the table below. Vegetation control treatments had a greater effect on tree height at the end of the first year after planting when pines were planted into a tall fescue sod compared to those planted into bermudagrass. Independent of the sod type, tree height was greatest when the competing vegetation was controlled by the use of landscape cloth. Over the course of the growing season, the presence of competing vegetation, with 2 feet of the pine trees, was less when the landscape cloth was used compared to the herbicide treatments.

The results of this study indicate that vegetation control is more important for obtaining fast early growth by transplanted pine trees when planted in tall fescue as compared to bermudagrass.

Table 1. Effects of sod type and vegetation control treatment on pine tree height after the first year of growth.

Vegetation Control	---------- Sod Type ----------	
Treatment	Tall Fescue	Bermudagrass
	---- Tree height (inches) -----	
No Control	8.3	11.1
Chemical Control	10.2	11.2
Landscape Cloth	10.3	12.1

The 2002 Farm Bill contained new programs and strengthened existing programs offered through NRCS/USDA that can reduce the cost of establishing agroforestry planting. A brief description of these programs is provided below. Those that are particularly designed to aid in the establishment of agroforestry plantings are noted. Details and specifications of the programs and related practice can vary from state to state and sometimes from county to county. Therefore, it is important that individuals contact their local NRCS district conservationist for more information. In recent years I heard an excellent program regarding these cost share programs by NRCS's State Forester, Nancy Young.

Conservation Reserve Program (CRP). This is the oldest of the cost share program that was established in 1986. The objective of this program is to reduce soil erosion by replacing agricultural production on land with erodible soils to some type of perennial cover, usually grasses or trees. Therefore only highly erodible cropland that has been planted for 4 of the 6 years preceding enactment of the 2002 law and marginal pastureland are eligible. Under CRP, the landowner agrees to develop and implement a conservation practice for 10 or 15 years In return for establishment of conservation practice, the landowner receives a payment for the cost of establishment and an annual lease payment. The cost share payment for establishment typically is 50% of the estimated establishment cost. However in certain locales, like watersheds of scenic rivers, etc., the cost share payment may include sign up bonus, etc. thus raising the payment to a value equal to or greater than the estimate establishment cost. Rental payments are annual payments based on length of agreement. The landowner is expected to follow the maintenance practices detailed in the conservation plan.

CRP has been a successful program. Increased occurrence of at least two conservation practices, grass waterways and forested riparian buffers, can be linked to CRP. Last fall while traveling across central Kansas on I-70, I was surprised at how common grass waterways have become in wheat fields and other crop lands. Another practice supported by CRP is grass contour filter strips. I also noted this practice fairly often along I-70 last fall in Kansas.

CRP can be used to establish forested riparian buffers to help maintain the quality of water running off of crop and grazing lands. The following specifications were included in the 2001 draft guidelines for such practices: 1) the buffer must be 35 to 180 feet in depth; 2) buffers must contain at least 2 species of hardwood trees; and 3) trees need to be planted in excess of 300 seedlings per acre.

Wetlands Reserve Program (WRP). The objective of WRP is to restore previously naturally occurring wetlands to their original condition. Most privately owned wetlands converted to agricultural use prior to 1985 are eligible. A plan to restore the land to wetlands with wildlife benefits must be possible. The length of the agreement is 10 or 30 years or permanently. The landowner can develop an "easement" in return for a one-time, up front payment. Cost share payment is up to 100% of the cost of establishing the wetlands. The landowner is obligated to develop and follow a plan for the restoration and maintenance of the wetland.

Grassland Reserve Program (GRP). GRP is similar to WRP except the target land practice is grasslands rather than wetlands. GRP is a new program, just authorized in the 2002 Farm Bill. The objective of GRP is to enhance the quality of grasslands by sustainable management practices. Privately owned grassland, shrubland and land containing forbs or land that historically contained those features is eligible. A minimum of 40 contiguous acres is required for enrollment; however exceptions are possible. The

length of the agreement is 10, 15, 20, or 30 years or permanently. An annual payment is based on the length of the agreement. An "easement" can be developed in return for a one-time, up front payment. Cost share of practices to enhance the sustainability of grasslands is up to 90%. The landowner is obligate to develop and comply with a plan for the easement or restoration agreement and assist with installation costs that are covered by the cost share.

Wildlife Habitat Incentives Program (WHIP). The objective of WHIP is to increase habitat for wildlife. All privately owned land is eligible, unless it is currently enrolled in CRP, WRP or a similar program. The length of the agreement is 5 to 15 years. Cost share of establishment costs is up to 75%. The landowner is obligated to prepare and follow a wildlife habitat development plan and assist with installation costs. WHIP can be used to offset some of the cost associated with establishing trees.

Environmental Quality Incentives Program (EQIP). The objective if EQIP is to provide landowners with assistance in establishing practices that reduce the impact of agriculture on the environment. All privately owned land in agricultural production, including cropland, grassland, pastureland, and non-industrial private forest land, is eligible. The length of the agreement is 1 to 10 years. The rental payment is an annual payment based on the length of the agreement. Cost share is up to 75%. The types of practices that EQIP can assist with includes: establishment of grass waterways, windbreaks, riparian buffers, stream bank protection, rotational grazing, and tree stand establishment and improvement. The landowner is obligated to develop and follow an EQIP plan that describes the conservation and environmental purposes to be achieved and assist with installation costs. The specifications of the EQIP under the 2002 Farm Bill are being developed. The time in which NRCS accepts comments regarding the new rules for EQIP will close shortly. Once these comments from the public have been analyzed, NRCS should have the final rules developed for EQIP.

Conservation Security Program (CSP). CSP was authorized as a new program in the 2002 Farm Bill. Being a new program, NRCS needed to develop rules and guidelines for the program and then provide a public comment period before final rules and guidelines are in place. I am not sure of the stage of development for CSP at present. The objectives of this program are fairly broad and include: reducing water and wind erosion, conserving soil and water resources, stabilizing streams and managing animal manure. All privately owned agricultural and forested land that is a part of an agricultural operation is eligible. The length of the agreement is 5 to 10 years. The annual rental payment is based on the length of the agreement. Cost share of implementation of practices is up to 75%. The landowner is obligated to develop a conservation security plan to install and/or maintain conservation practices.

Forest Land Enhancement Program (FLEP). FLEP is a new program that was authorized in 2002 Farm Bill. The objective of FLEP and FRPP (described below) is to protect and enhance the nation's forest resources. All private forest lands are eligible for financial, technical, and educational assistance. Each state is to develop a minimum acreage of forest land, not to exceed 25 acres. Assistance is available up to 1,000 acres per year, with exceptions possible up to 5,000 acres. The length of the agreement is 10 years or more. The cost share is up to 75%. The landowner is obligated to develop and implement a management plan, and assist with the remaining installation costs.

Farm and Ranch Lands Protection Program (FRPP). Private land that contains prime farmland or other unique resources and is subject to a pending easement from an eligible entity. The length of the agreement is permanent. In return for the easement, the landowner receives a one-time, up front payment. The landowner is obligated to use the land for agricultural/forestry purposes, develop a conservation plan and comply with the terms of the easement.

Shiitake mushroom production in the U.S. has expanded greatly in the last twenty years to $27 million in 2001. Today, the industry can readily be segregated into two different types of production systems. One system utilizes an artificial substrate to produce mushrooms. This system accounts for a large portion of the total U.S. shiitake production and yields mushrooms that are sold fresh in bulk at relatively low prices in grocery stores. The other production system utilizes hardwood logs to grow mushrooms. Log-grown shiitake mushrooms tend to be organically grown and are marketed either fresh to high end users (like restaurant chefs) or dried as a component of a partially prepared organic food. Prices for log-grown shiitake tend to be 3 to 8 times higher than that of substrate-grown shiitake, making them attractive for small farmers interested in a relatively high return to management.

A small farm with shiitake sales of $10,000 annually will have about 3,000 logs assuming one log produces 1 pound of mushrooms annually and an average wholesale price of $8 per pound. The average life span of a log is 2 to 3 years. Therefore, the small farm producing $10,000 worth of shiitakes will generate at least 1,000 spent shiitake logs annually, representing about 10 cubic yards of waste material. This is a considerable volume of material, especially since there is no valuable use for this material at present.

Composting spent logs may be a way for shiitake producers to capture value from this waste product. Compost has been recognized for a long time as an excellent source of the major plant nutrients, i.e., N, P and K. There is growing evidence that the incorporation of compost into agricultural lands has additional benefits. These benefits include: 1) increased levels of other plant nutrients; 2) improved soil tilth; 3) reduced need for tillage (through a reduction in compaction); 4) decreased weed pressure; and 5) increased levels of soil micro and macro fauna. Recent research indicates that amending soils with certain composts decreases specific foliar diseases like leaf mosaic and green leaf [citrus] wilt and soil-borne pathogens like nematodes. Therefore, using compost as a soil amendment makes sense as a means of managing inputs while promoting over-all soil health.

Technology appropriate for composting the volume of material produced by a shiitake operation may not be readily available at this time. Protocols and equipment have been developed for converting large volumes of waste materials into compost. Many of these systems employ a windrow type of operation that requires expensive equipment to turn the compost, an expense usually beyond the means of smaller farms. There are many examples of composting operations that are relatively inexpensive, but these are geared primarily to the home gardener. There seems to be a distinct lack of technology for this intermediate size composting operation. A cooperative research project involving the Center and the Shirley Community Development Corporation (SCDC) was conducted to test four methods of composting of chipped spent shiitake logs.

Composting Materials and Methods. Spent shiitake logs (three to six years old) were chipped using a standard, B-60 rotary drum chipper. Chipped logs composed 80 to 85% of the total material by weight. Green grass clippings were added at 15% of material by weight. Urea was incorporated at the rate of 3 pounds per cubic yard of chipped logs and grass clippings to yield a C:N ratio of 30:1. Commercial compost starters, Compo Star (Petrik Lab, Woodland, CA) and Compost Aid (Nitron, Inc., Fayetteville, AR) were added to each pile according to manufacturers' suggestions. Chipped logs, grass clippings, N and microbes were layered or mixed into test batches. Batches were watered and additional moisture was incorporated during dry periods through a sprinkler system.

Four types of composting methods that have potential for small farms were tested. These methods included an in-vessel tumbler, a wire cage, passively aerated static piles, and actively aerated static piles.

In-vessel tumbler: During the composting process the ingredients in an in-vessel tumbler (Compost Tumbler P/N 1788-01, Home Gardener) were turned 3 revolutions every day. The vessel had a diameter of 3 feet and was 3 feet deep.

Wire Cage: A wire cage composting apparatus measuring 4 x 4 x 3.5 feet was constructed from hardware cloth and 1.5 inch angled iron. Contents of the wire cage were turned weekly.

Passively aerated static pile: The passively aerated static pile was constructed over 4 inch diameter plastic piping with 0.4 inch perforations approximately every 9 inches along its length. Plastic pipes were placed approximately 12 inches apart. The compost pile initially measured 7 feet wide, 20 feet long and 4 feet high. This pile was constructed on top of and perpendicular to the plastic piping.

Actively aerated static pile: We employed a pressure system of aeration by utilizing an old household clothes dryer rather than suction for the actively aerated static pile. This pile measuring 7 feet wide, 5 feet high and 40 feet long was constructed on center above the plastic pipe described above. This plastic pipe was connected to the exhaust pipe of an old household type clothes dryer (Whirlpool, model# LWE5500WO). It was not necessary for the dryer to have a functional heating element, just capable for blowing air. Ambient air from the dryer was blown into the pile for 5 minutes every hour using a Schyller timer as a controller for the first trial. Under such an aeration regime, the pile tended to lose moisture. Ambient air was blown into the pile 1 minute every hour after the first trial to prevent drying out of the pile.

Comparison of four composting methods. The in-vessel tumbler method of composting was the system with the shortest time required from start to finish with an average finishing time of three weeks. The initial cost of the tumbler was about $200.00. Initial construction of the compost pile required about 1 hour of labor and a small amount of labor daily to turn the pile. The finished compost yielded about 0.4 cubic yards. Volume reduction (i.e. final volume/ starting volume) was greatest for composting by the in-vessel method. Although the system was designed primarily for household/garden use, the relatively short time to obtain a finished product may enable this system to convert a sufficient number of spent logs into compost for the targeted enterprise. About 12 batches over a 9-month period would have to be processed by the in-vessel system every year to convert the spent logs created by a $10,000 shiitake operation into compost. However, there may not be 9 months of suitable weather in northern Arkansas. The small volume of the in-vessel and its relatively large surface area may compromise the vessel's ability to maintain thermophilic temperatures during cold weather.

Initial construction of the wire cage pile required about 9 hours of labor. On average only 15 weeks were necessary for the composting process by the wire cage method. However, during the first trial, incubation period

was almost 5 months because the composting materials became over-saturation with water from heavy rain. Without some covering, this system is susceptible to complications resulting from heavy rains. Cost for set-up was $100.00 for a cage with 2.3 cubic yards of capacity. The composting process yielded 1.5 cubic yards of finished product. The heaviness of the caged compost required five men or a truck or a winch for turning. This system was labor intensive, both in term of periodic maintenance and set-up.

The passively aerated static pile method was an effective and efficient system to compost spent shiitake mushroom logs. The time required from start to finish averaged 18 weeks. It was easy to build with moderate set-up costs and labor. Costs for set-up were just over $100.00 for 18 cubic yard. About 17 hours of labor were necessary to construct the pile but periodic maintenance was almost non-existence. This pile yielded 9 cubic yards of finished compost. This system appears to be very effective for a shiitake operation producing several thousand spent logs annually.

The actively aerated static pile method of composting also appeared to be suitable for the targeted shiitake operation. Cost for setting up this pile was $110.00 ($50 for an used dryer with a broken heating element) for a 26 cubic yard pile. The time required from start to finish averaged 17 weeks. Composting process yielded 14 cubic yards of material. Labor expenditure after constructing the pile was almost non-existence. Drying of compost in the interior of the pile was a problem during the first trial. Either increasing initial moisture content 70% or decreasing the time that air was blown through the pile from 5 to 1 minute every hour could reduce drying of the pile.

The compost from the four methods yielded compost similar in chemical composition. The average C:N ratio was 20:1 and average N content was 2%. The pH of the resulting composts averaged 6.6. The compost had relatively high concentrations of Ca, averaging 3 %. Concentrations of P were relatively low, averaging 0.14 %. Levels of Cu and Zn were below thresholds that would be considered excessive for optimum plant growth. Samples of wood chips (un-composted) from spent shiitake logs (n=4) and two samples of compost from 2 batches of each from the two static pile methods (n=4) were analyzed for total fungi and bacteria. These results suggest that composting changed the relative abundance of fungi to bacteria. A compost high in fungi may be of benefit to growth woody plants.

The ability of the compost to support vegetable production has been assessed in a greenhouse experiment at the Center and in outdoor beds at the SCDC. Both demonstrations indicated that the compost is an excellent growing media for plants.

USDA Committee Held an Appreciation Luncheon for Center Employees

At lunchtime on April 2, 2003, the USDA Committee of the Booneville Chamber of Commence held a luncheon for employees of the Dale Bumpers Small Farms Research Center on behalf of the community to express appreciation for the Center and its activities that enrich the local community. The USDA Committee was formed in the 1970's. The USDA Committee has been instrumental in developing support and funding for the Center since its creation. USDA Committee made presentations regarding the history of the Center's establishment and why the local community thought such a Center was worth their investment to establish. One of the overarching objectives that the USDA Committee sought from the establishment of a research center was an instrument to enhance local educational opportunities. The Center has an active outreach program providing numerous opportunities for interaction between public schools, college students, farmers and ranchers and Center employees throughout the year, which we hope satisfies the expectations of the community. On behalf of ARS, I want to express appreciation to the USDA Committee and the local communities, in particular those of South Logan County, for their support and interactions over the years.

Tentative Sheep Field Day Agenda

Registration	**8:00**
Welcome	**8:30**
Summary of Research Activities	**8:30**
Dr. Joan Burke, DBSFRC	
Safe Drenching Techniques	**9:00-12:00**
Dr. James Miller, LSU	
Youth Program	**9:00-12:00**
Lunch	**12:00**
Production for Optimal Meat Quality	**1:00**
Dr. Jason Apple, UofA	
Sustainable Farm Income	**1:30**
Mr. Billy Moore, ACES	
Sire Testing to identify Best Bucks	**2:00**
Dr. Terry Gipson	
Custom Processing for a Superior Product	**2:40**
Mr. Kendrick Ketchum	
Swap Shop - Producer to producer Advice	**3:10**
Sheep and Goat producers	
Sheep and Goat Exchange	**3:30**

Dale Bumpers Small Farms Research Center is a partnership among three institutions:

ARS- conducts research related to livestock production and agroforestry; ARS staff can be reached at 479-675-3834.

PMC/NRCS- evaluation of vegetation and vegetation technology to retain soil and its productive capability; NRCS staff can be reached at 479-675-5182.

Division of Agriculture / University of Arkansas- dissemination of agricultural information. Extension Specialist, Billy Moore, can be reached at 479-675-5585.

ARS scientists at DBSFRC and their primary research focus:

David Brauer- Agronomist/Research Leader investigating both agroforestry and livestock production

Glen Aiken- Agronomist investigating production practices for stockers

David Burner- Agronomist investigating crop production in agroforestry systems

Joan Burke- Animal Scientist investigating reproductive performance in cattle and production practices for hair sheep

Michael Looper - Animal Scientist investigating beef cattle production.

Dan Pote- Soil Scientist investigating the effects of management practices on sediment and nutrient retention in agroforestry and livestock production systems.

Organizations promoting agriculture in the Ozark Region

The information below is not an exhaustive list of organizations trying to help farmers and ranchers in the Ozarks. If your organization is interested in being included, please contact David Brauer.

Poultry Production and Product Safety Research Unit (PPPSRU)/ARS/USDA/Center of Excellence for Poultry Science is located on the campus of the University of Arkansas in Fayetteville. PPSRU conducts research to solve problems related to: 1) diseases and physiological disorders that are of economic important to the poultry industry; and 2) land application of waste from the poultry production. PPPSRU can be reached at 479-575-4202 or on the world wide web at www.uark.edu/~usdaars/.

South Central Agricultural Research laboratory (SCARL)/ARS/USDA conducts multi-disciplinary research for developing technologies to establish and sustain production and post harvest quality of alternative crops such as vegetables, small fruits, and kenaf. The Laboratory is co-located with the Oklahoma State University's Wes Watkins Research and Extension Center in Lane, OK. SCARL can be reached by phone at 580-889-7395 or on the world wide web at www.lane-ag.org.

Shirley Community Development Corporation (SCDC) is a community-based organization formed to plan and initiate short- and long-term development programs for Shirley, AR and the surrounding communities. These programs focus on economic development, educational enhancement, youth job training, and service projects that improve and strengthen the community. SCDC is involved in projects that research and demonstrate the skills and techniques needed for production and marketing of specialty agricultural crops. The present focus is on log-grown Shiitake mushrooms. SCDC operates the Shiitake Mushroom Center as a training center. Recent additions include on-site production of garden bricks and stepping stones, raised bed herbal plots, twin wall polycarbonate greenhouse, and compost demonstration project. SCDC can be reached by phone at (501) 723-4443 or on the web at http://www.shiitakecenter.com/index.html.

The Kerr Center for Sustainable Agriculture in Poteau, OK offers leadership and educational programs to those interested in making farming and ranching environmentally friendly, socially equitable, and economically viable. The Kerr Center can be reached by phone at 918-647-9123, by email at mailbox@kerrcenter.com or on the web at www.kerrcenter.com.

ATTRA, Appropriate Technology Transfer for Rural Areas, is the national sustainable agriculture information center. ATTRA provides technical assistance to farmers, Extension agents, market gardeners, agricultural researchers, and other ag professionals. ATTRA is located in Fayetteville, AR. ATTRA staff members prefer to receive requests for information at 800-346-9140. ATTRA maintains a web site at www.attra.org

The Grassroots Grazing Group (GGG) is a network of livestock producers mainly from northwest

Arkansas but includes producers from many other states including Virginia, Missouri, and Oklahoma. GGG maintains a electronic mailing list on which members routinely share information and opinions regarding various topics on forage management and livestock production. Members meet monthly, usually at a member's farm, to see and discuss information related to grazing practices. Individuals interested in joining the GGG should contact Ann Wells at annw@ncatark.uark.edu.

The Center for Advancement of American Black Walnut is a non-profit organization promoting the planting of an improved variety of eastern black walnut for nut production. For more information contact the Center's Director, Jim Jones, at P. O. Box 600, Stockton, MO 65785, 417-276-6010 (voice), 417-276-6011 (fax), or jonesctr@hotmail.com (e-mail).

Information regarding the *Arkansas Cooperative Extension Service and the Division of Agriculture* can be found on the internet at the following web site: www.uaex.edu.

Attention

Are you interested in a person to speak at a meeting of your civic or agricultural group? If so, please contact David Brauer at 479-675-3834 to see if we can match your interests/needs to the expertise of the Center's staff.

If you did not receive this newsletter by mail and would like to do so, please contact the Center and we will place you on our mailing list.

Upcoming Events

September 2003 - 2nd Sheep Field Day. 8:00 a.m. - 3:30 p.m.

You can help us!

Would you like to receive our newsletter via e-mail. It would save us time and money. Send an e-mail to lalbright@spa.ars.usda.gov indicating your desire to receive the newsletter electronically.

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